Barcelona Supercomputing Center - Earth Sciences
Centro Nacional de Supercomputación

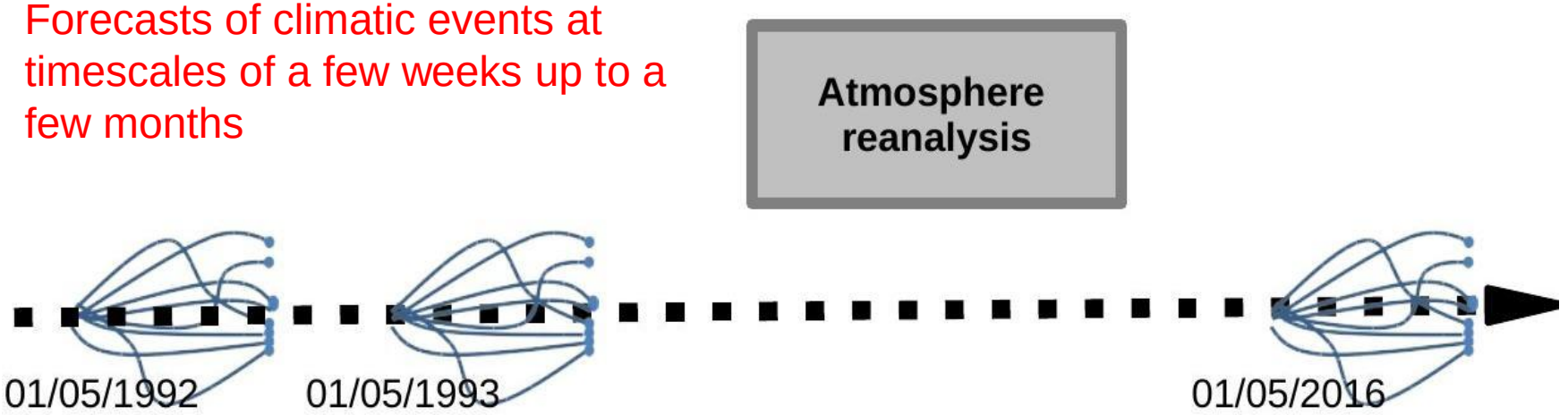
Assessment of Seasonal Climate Forecast Skill of EUROSIP over Europe

Niti Mishra, Chloé Prodhomme, Virginie Guemas, Francisco J. Doblas-Reyes

imprex
Learn from today to anticipate tomorrow

A. Seasonal Climate Forecasts (SCFs)

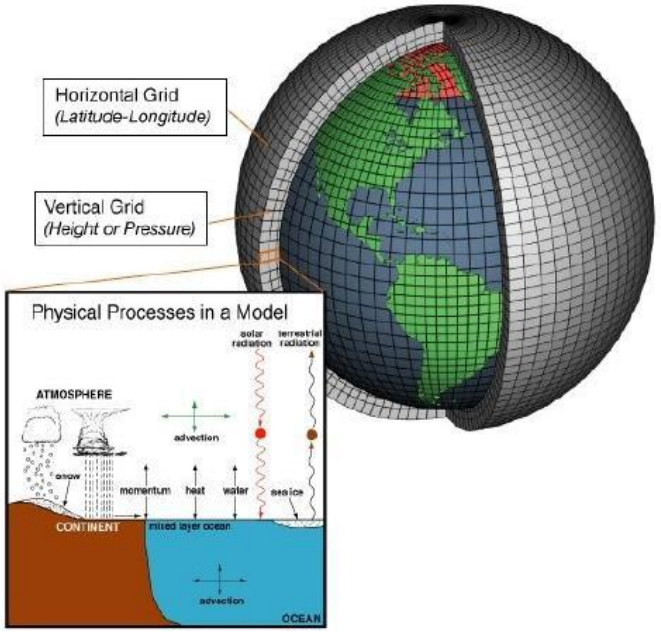
- Forecasts of climatic events at timescales of a few weeks up to a few months



Land reanalysis

Ice reanalysis

Ocean reanalysis



B. Need for Assessment of SCFs

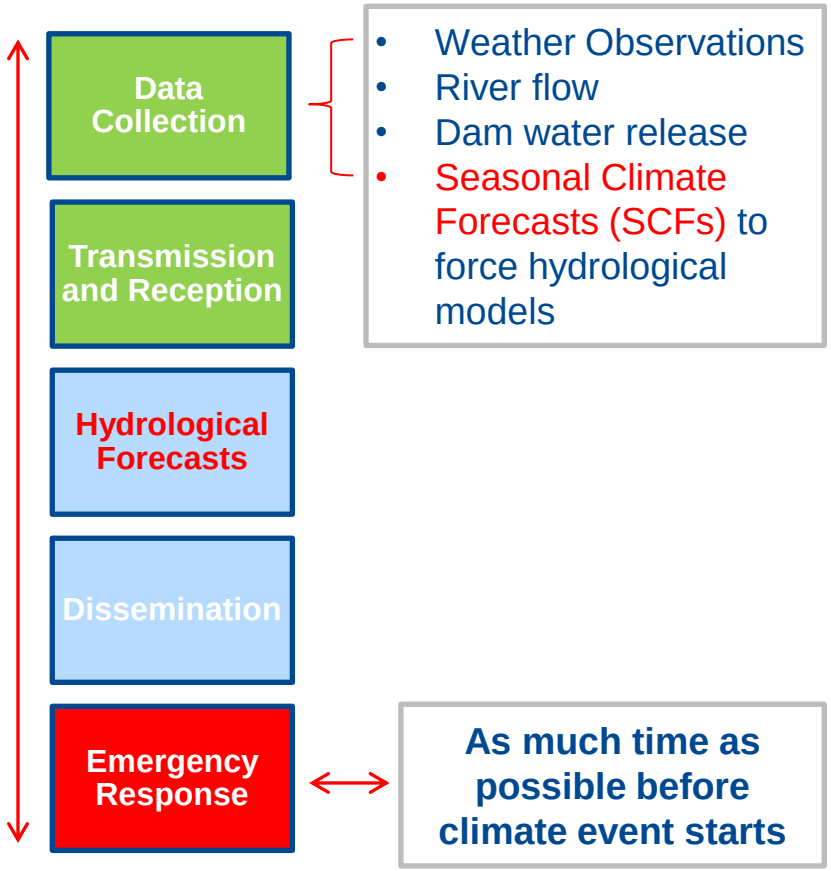
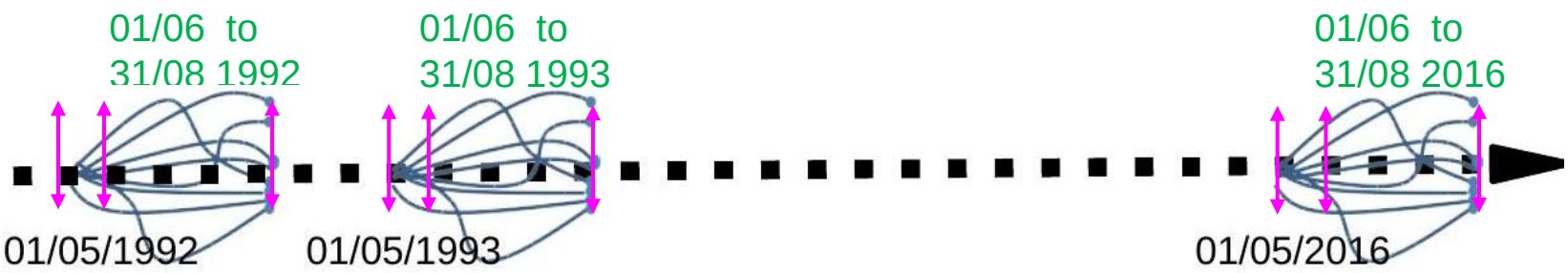


Fig. Flood/Drought Forecasting and Early Warning Support System

- SCFs are useful in the detection, monitoring and early warning of climate hazards as it allows estimations a few months in advance
- New systems are now in place to provide SCFs over Europe. However, very few have focused on the assessment of their forecast skill to date
- Our goal under IMPREX is to quantify the skill of SCFs of EUROSIP multi-model system, which can be used for hydrological purposes

C. Data

Climate Forecasting System (CFS)	The EUROSIP Multi-model Seasonal Forecasting System	→	i. Glosea5, Met Office - 24 ii. System4, ECMWF - 51 iii. System2, NCEP - 28 /24 iv. System5, MF - 15
Area	European Region specified as 20W-70E and 25N-75S		
Period	1992 – 2012		**Observation**
Climate Variable	i. Seasonal Temperature ii. Seasonal Precipitation	→	i. ERA-Interim (ERAINT) ii. Global Precipitation Climatology Project (GPCP)
Seasons	i. Winter: December to February (DJF) ii. Summer: June to August (JJA)		
Initialization period	i. November for Winter ii. May for Summer		



D. Temporal Anomaly Correlation Skill

- Skill Score for deterministic forecast
- Ensemble Mean of Seasonal Anomalies (EMSA) per CFS
  - ability to forecast departure from seasonal cycle
  - anomalies calculated in Leave-One-Out (LOO) cross validation mode

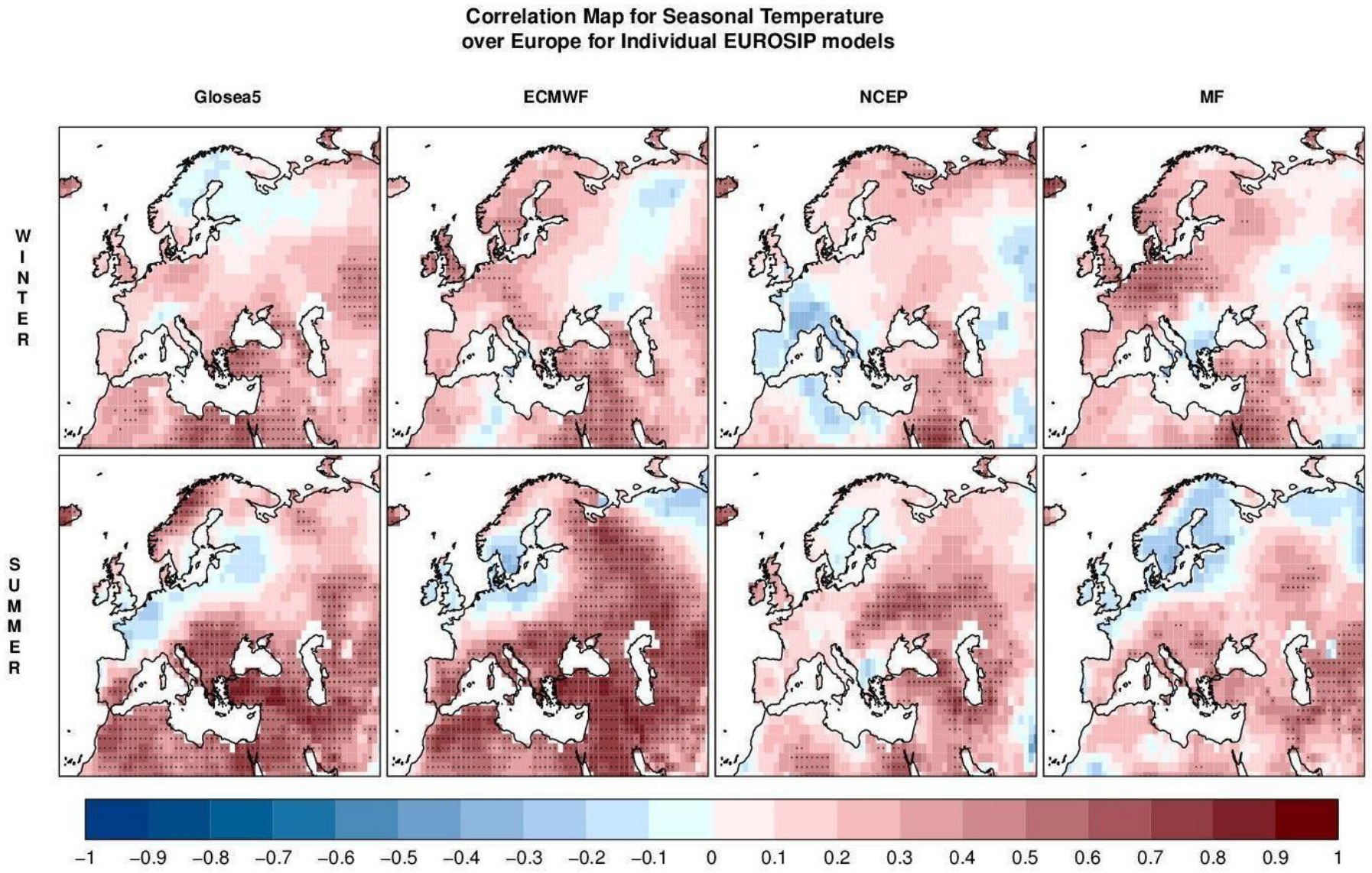
$$\rho = cor(X, \hat{X}) = \frac{cov(X, \hat{X})}{\sqrt{var(X), var(\hat{X})}}$$

$$cov(X, \hat{X}) = \frac{1}{N} \sum_{t=1}^{n} (x_t - \bar{x_t})(\hat{x}_t - \bar{\hat{x}_t})$$

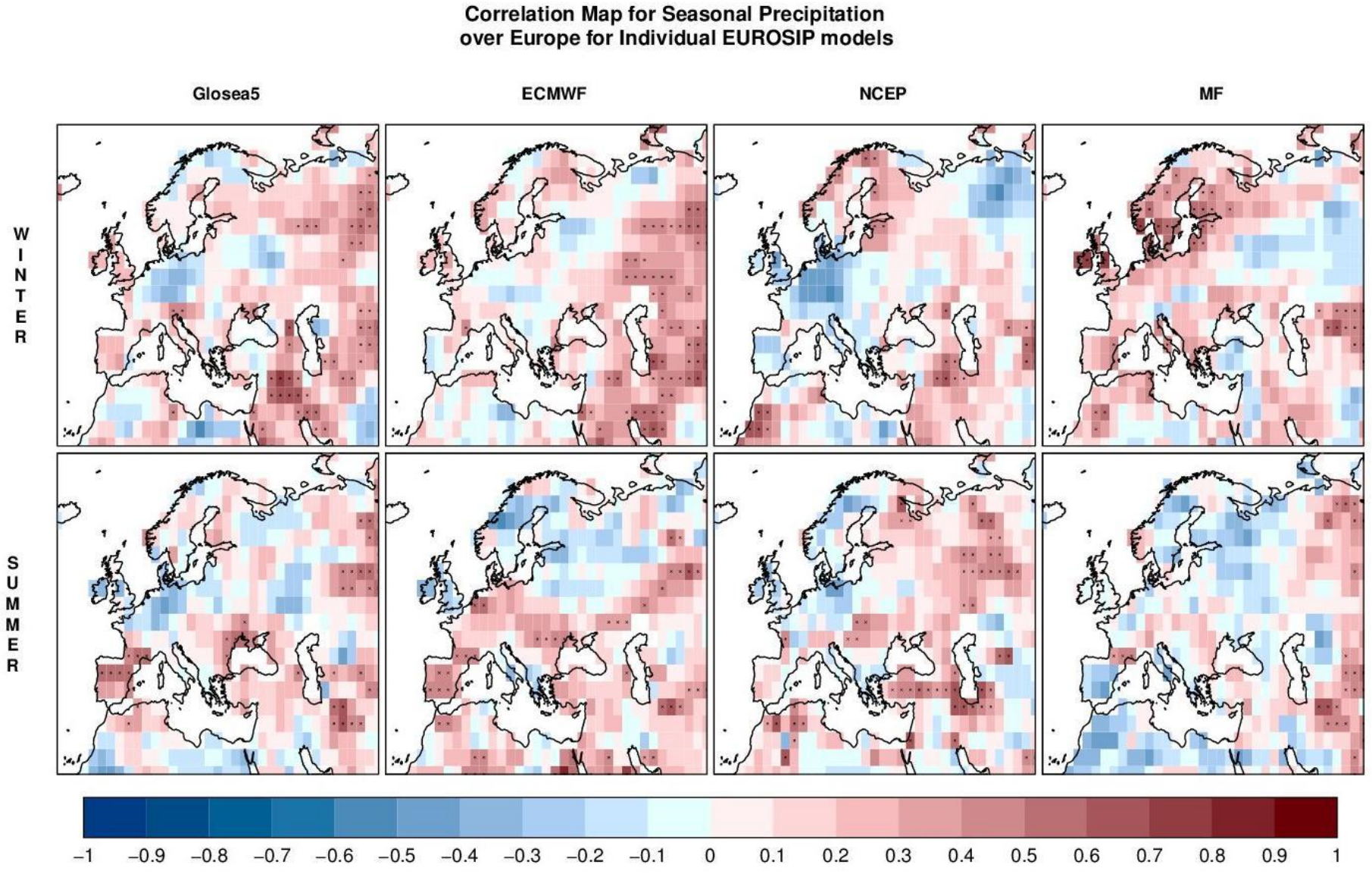
Formula for Pearson Correlation Coefficient

- Measures the degree of the linear relationship between forecast and observation
- One-tailed student t-distribution test at 95% confidence level

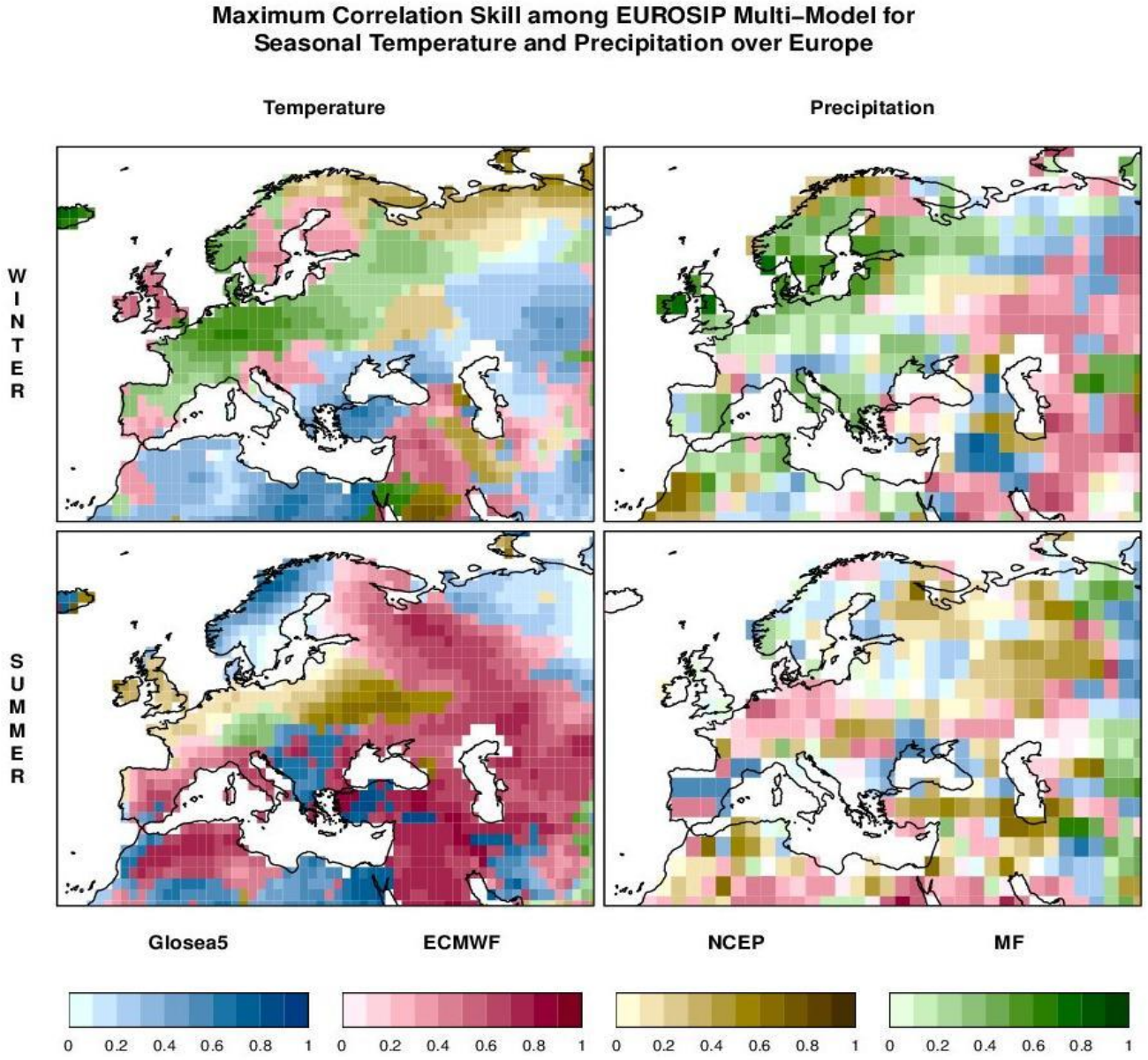
D. Temporal Anomaly Correlation Skill



D. Temporal Anomaly Correlation Skill



D. Max. Temporal Anomaly Correlation Skill



E. Best Way to Combine EUROSIP Multi-model

Name		Details	
Multi-Model Mean (MMM)	i. ii.	Averaging the EMSA forecasts of each of the 4 independent CFSs i.e. equal weight for each CFS	➢ Each model is equally likely to represent the truth
Best OLS Combination Model (BOCM)	i. ii. iii.	Weights based on Ordinary Least Squares (OLS) 15 possible combination out of 4 CFSs Weights from OLS model whose predictions have the highest correlation with the observation dataset is chosen as BOCM	➢ OLS is a popular method for obtaining parameters of significance for any given variable within the model
Correlation as Weights Model (CAWM)	i. ii.	ACC value of each CFS is multiplied to EMSA forecast of the respective CFS CFS with higher correlation has higher weight	➢ Correlation is popularly used as a measure of skill in meteorology

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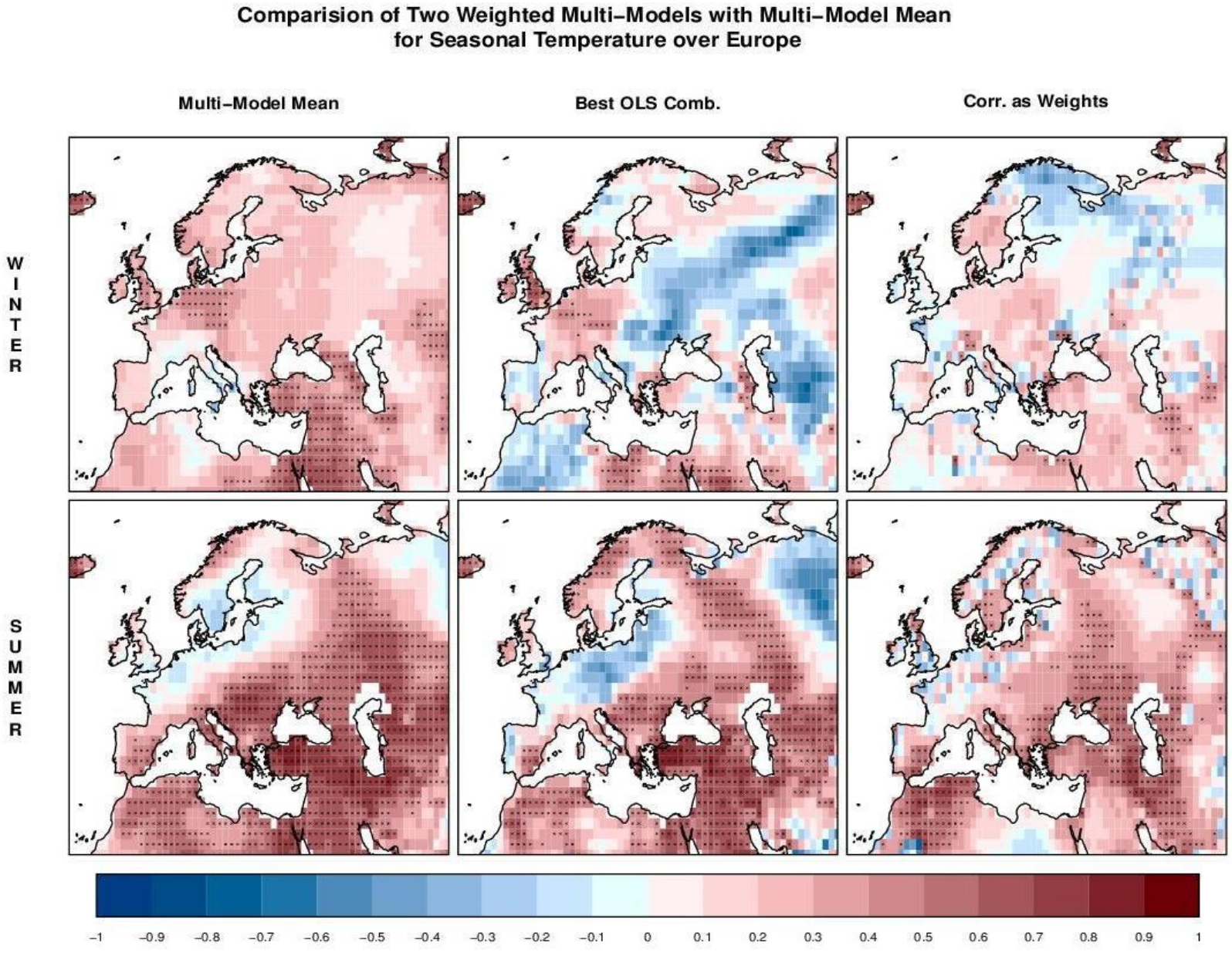

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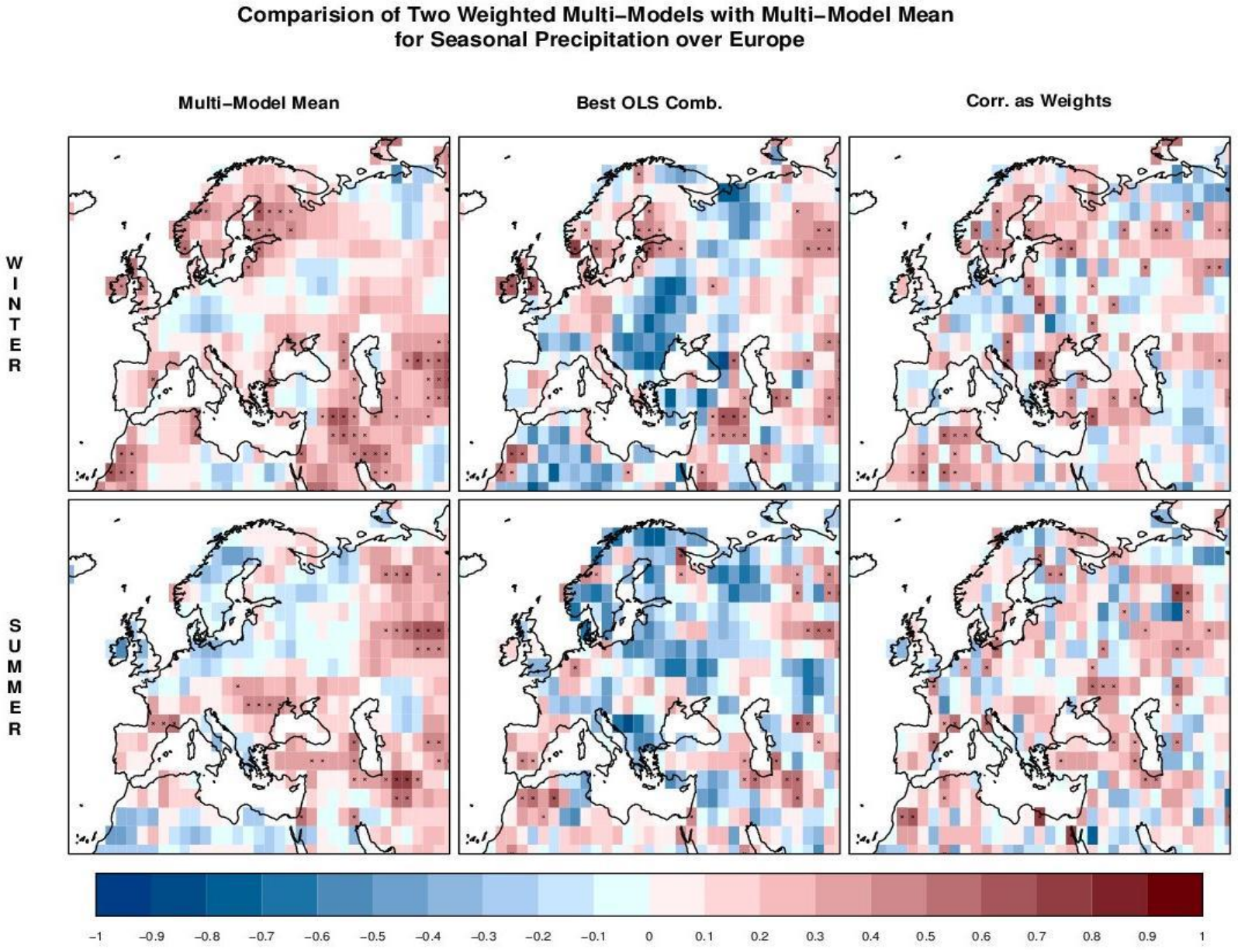

F. Summary

- **Seasonal Temperature Skill**
  - Higher in summer than winter
  - Each CFS exhibit higher prediction skill over a unique region of Europe making multi-model system desirable over using only a single CFS

- **Seasonal Precipitation Skill**
  - Very low and sporadic over Europe
  - Comparatively skill is higher in winter than summer

G. Conclusion

- **Important to be aware of the forecast skill of the model being used**
  - Overall in Europe, the seasonal forecast skill is low for temperature and precipitation
  - So it is important to assess the forecast data before using it in hydrological models & to choose the model that corresponds best to the needs

- **BSC is able to provide training sessions on using tools and methodologies to perform forecast skill assessment for climate variables**

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QUESTIONS ???

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Thank you!

For further information please contact
niti.mishra@bsc.es